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MEDIUM-MU TWIN TRIODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:

Voltage	6.3	ac or dc volts
Current	0.3	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield**	
Grid to plate (Each unit)	1.5	1.4	μμf
Grid to cathode and heater (Each unit)	1.9	2.1	μμf
Plate to cathode and heater (Unit No.1)	0.28	1.3	μμf
Plate to cathode and heater (Unit No.2)	0.32	1.4	μμf
Grid of unit No.1 to grid of unit No.2	0.011 max.	0.01 max.	μμf
Plate of unit No.1 to plate of unit No.2	0.5 max.	0.3 max.	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Plate-Supply Voltage	100	volts
Cathode Resistor	220	ohms
Amplification Factor	20	
Plate Resistance (Approx.)	4000	ohms
Transconductance	5000	μmhos
Plate Current	8.5	ma
Grid Voltage (Approx.) for plate current of 10 μa	-9	volts

Mechanical:

Operating Position	Any
Maximum Length (Excluding flexible leads)	1-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.366" to 0.400"
Dimensional Outline	*See General Section*
Bulb	T3
Leads, Flexible, Tinned	8
Minimum length	1.5"
Orientation and diameter	*See Dimensional Outline*
Maximum untinned distance from base seat	0.050"

*: See next Page.

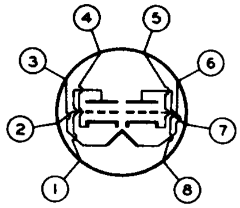
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Base. . . . . .JETEC No.E8-10

BOTTOM VIEW



Lead 1 - Plate of Unit No.2
Lead 2 - Grid of Unit No.2
Lead 3 - Heater
Lead 4 - Cathode of Unit No.2
Lead 5 - Cathode of Unit No.1
Lead 6 - Heater
Lead 7 - Grid of Unit No.1
Lead 8 - Plate of Unit No.1

AMPLIFIER — Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

For operation at altitudes up to 60,000 feet

PLATE VOLTAGE	165 max.	volts
GRID VOLTAGE:		
Positive bias value	0 max.	volts
Negative bias value	55 max.	volts
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	200 max.	volts
Heater positive with respect to cathode .	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	220 max.	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For cathode-bias operation.	1.2 max.	megohms

* With external shield having inside diameter of 0.405" connected to cathode of unit under test.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit and are Initial, Unless Otherwise Specified

	Note	*Min.*	*Max.*	
Heater Current.	1	280	320	ma
Direct Interelectrode Capacitances:				
Grid to plate	2	1.2	1.8	μμf
Grid to cathode and heater. . .	2	1.4	2.4	μμf
Plate to cathode and heater (Unit No.1)	2	0.2	0.36	μμf
Plate to cathode and heater (Unit No.2)	2	0.22	0.42	μμf
Grid of unit No.1 to grid of unit No.2	2	-	0.011	μμf

Notes 1 and 2: See next page.

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	Note	*Min.*	*Max.*	
Plate of unit No.1 to plate of unit No.2	2	-	0.5	μμf
Amplification Factor.	1,3	17	23	
Plate Current (1)	1,3	6	11	ma
Plate-Current Difference Between Units	1,3	-	2	ma
Plate Current (2)	1,4	-	100	μa
Transconductance:				
With heater volts = 6.3	3	4100	5900	μmhos
Individual change from 0 to 500 hours.	1,3	-	20	%
Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts.	3	-	15	%
Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average. . . .	1,3	-	15	%
Reverse Grid Current.	1,5	-	0.3	μa
Grid-Emission Current	6,7	-	-0.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,8	-	5	μa
Heater positive with respect to cathode.	1,8	-	5	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater negative with respect to cathode.	1,8	-	10	μa
Heater positive with respect to cathode.	1,8	-	10	μa
Leakage Resistance:				
Grid to all other electrodes tied together	1,9	100	-	megohms
Plate to all other electrodes tied together	1,10	100	-	megohms
Leakage Resistance at 500 hours:				
Grid to all other electrodes tied together	1,9	50	-	megohms
Plate to all other electrodes tied together	1,10	50	-	megohms

Note 1: With 6.3 volts ac or dc on heater.
Note 2: Without external shield.
Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (μf) = 1000. Each unit tested separately. Unit not under test connected to ground.

Notes 4 to 10: See next page.

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Note 4: With plate volts = 100 and grid volts = -9. Each unit tested separately. Unit not under test connected to ground.

Note 5: With plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 200. Each unit tested separately. Unit not under test connected to ground.

Note 6: With 7.5 volts dc on heater.

Note 7: With plate volts = 100, grid resistor (megohms) = 1, and grid volts = -9. Preheated prior to testing for 5 minutes at heater volts = 7.5 ac or dc, plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 220.

Note 8: With 100 volts between heater and cathode. Each unit tested separately. Unit not under test connected to ground.

Note 9: With grid 100 volts negative with respect to all other electrodes tied together.

Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS AND PERFORMANCE DATA

Values are for Each Unit, Unless Otherwise Specified

Shock Rating:

Impact Acceleration. . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Fatigue Rating:

Vibrational Acceleration . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 6.3, plate-supply volts = 100, cathode resistor (ohms) = 220, cathode-bypass capacitor (μf) = 1000, plate load resistor (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . . 2000 min. cycles

Under the following conditions: Heater volts = 7 cycled one minute on and four minutes off, heater 140 volts

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rms with respect to cathode, and all other elements connected to ground. At the end of this test, tubes will not show heater-cathode shorts or open circuits.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage. . . . . 65 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Units connected in parallel, heater volts = 6.3, plate-supply volts = 100, cathode resistor (ohms) = 100, plate load resistor (megohms) = 0.01, and cathode-bypass capacitor (μf) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 65 millivolts rms is applied to the plates of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Life-test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a value of reverse grid current in excess of 1 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater volts = 6.3, plate-supply volts = 100, heater-cathode volts = 200 (heater positive with

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respect to cathode), cathode resistor (ohms) = 220, grid resistor (megohms) = 1, and bulb temperature (^{o}C) = 220. At the end of 500 hours, tube will not show permanent shorts or open circuits, and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual transconductance change, transconductance change with heater volts = 5.7, and 500-hour limits for reverse grid current, heater-cathode leakage current, leakage resistance, and the difference in transconductance between the initial value and average value shown under CHARACTERISTICS RANGE VALUES.

OPERATING CONSIDERATIONS

The *heater supply* should be well regulated because life and reliability of the 6111 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 6111 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation will crack the glass seals of the leads and damage the tube.

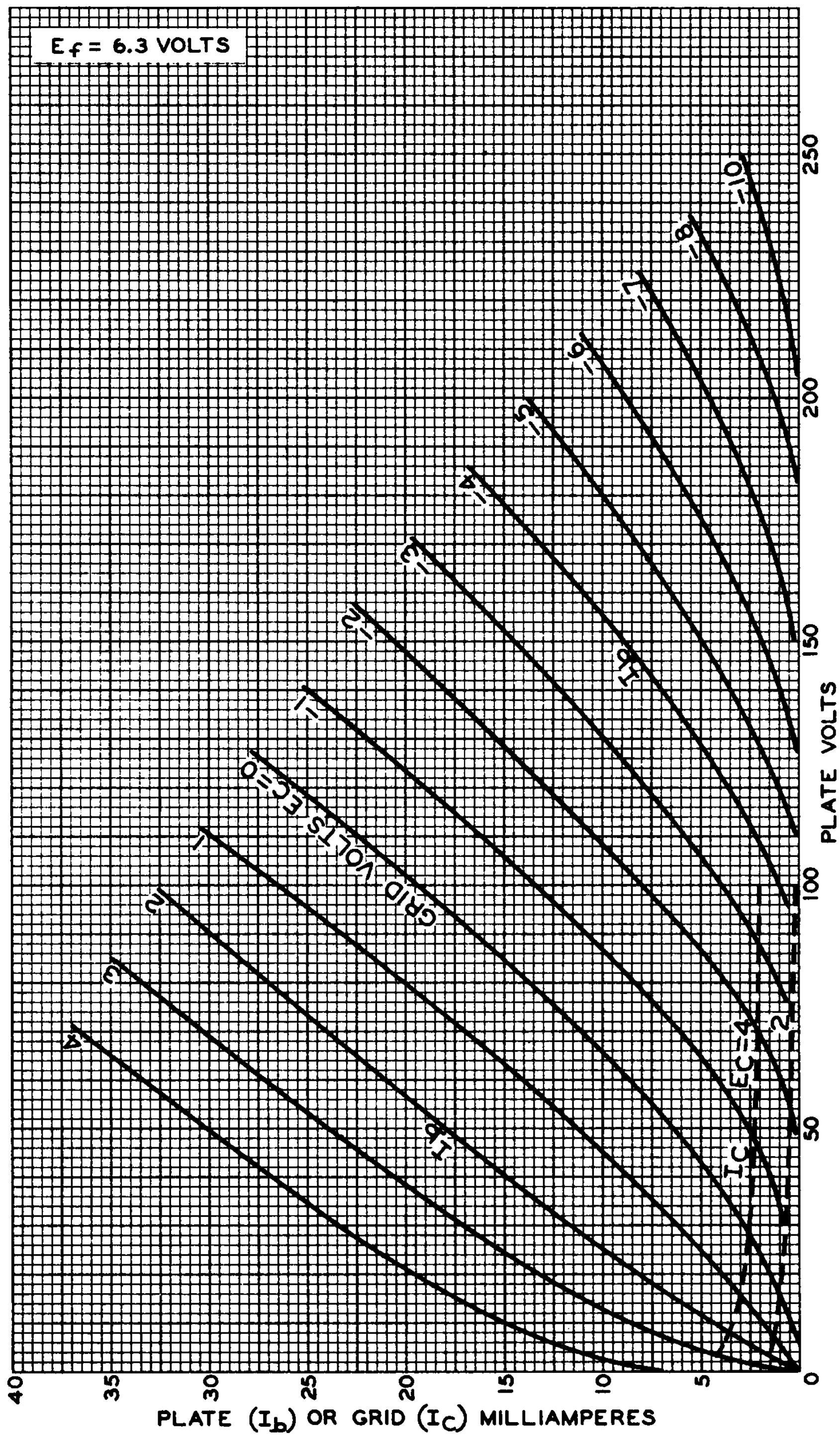
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AVERAGE CHARACTERISTICS

EACH UNIT



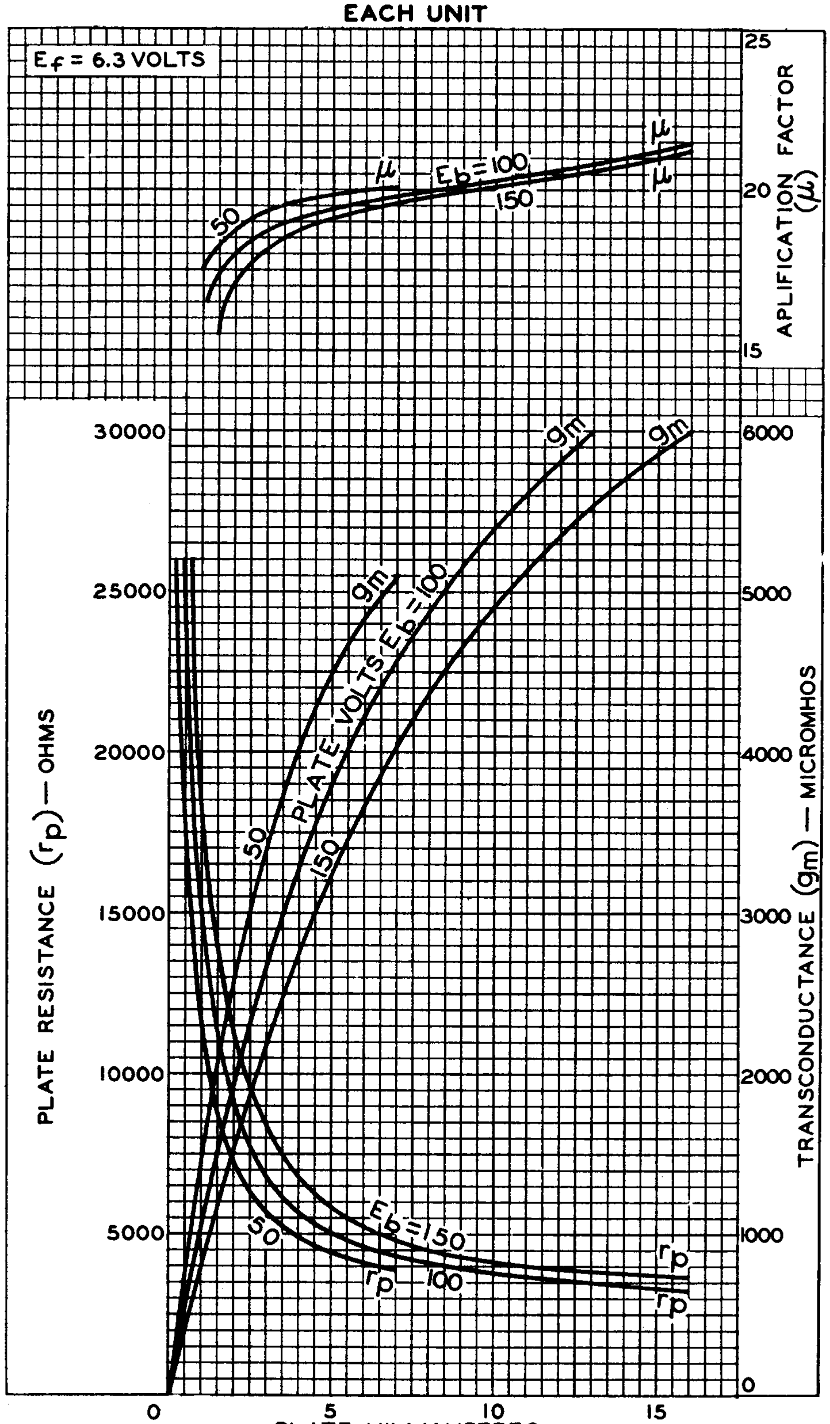
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AVERAGE CHARACTERISTICS

EACH UNIT



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